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*Indian Standard*

METHOD OF MEASUREMENT OF ACOUSTICAL  
NOISE EMITTED BY BALLASTS FOR  
GASEOUS DISCHARGE LAMPS

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## METHOD OF MEASUREMENT OF ACOUSTICAL NOISE EMITTED BY BALLASTS FOR GASEOUS DISCHARGE LAMPS

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NEW DELHI 110002

## *Indian Standard*

# METHOD OF MEASUREMENT OF ACOUSTICAL NOISE EMITTED BY BALLASTS FOR GASEOUS DISCHARGE LAMPS

## 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 11 August 1967, after the draft finalized by the Acoustics Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard covers the method of measuring acoustical noise emitted by ballasts for gaseous discharge lamps, such as fluorescent lamps, mercury vapour lamps, etc.

**0.2.1** This standard has been prepared at the specific request of Electric Lamps and Accessories Sectional Committee (ETDC 23) with a view to checking the noise level of ballasts.

**0.3** This standard is based largely on B.S. 2818 Part I : 1962 Auxiliaries for operation of fluorescent lamps on ac 50 c/s supplies, Part I : Ballasts, issued by the British Standards Institution.

**0.4** The test method includes a simplified acoustical environment in the form of a box, in addition to silent and echo-free room, for use in the factory.

**0.5** In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

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## 1. SCOPE

**1.1** This standard describes the method of measuring the noise emitted by ballasts for gaseous discharge lamps such as fluorescent lamps, mercury vapour lamps, etc.

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## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definition shall apply in addition to those contained in IS : 1885 (Part III)†.

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\*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary: Part III Acoustics.

**2.1 Ballast** — A unit inserted between the supply and one or more discharge lamps, which by means of inductance, capacitance or resistance, singly or in combination, serves mainly to limit the lamp(s) current to the required value.

It may also include the following:

- a) Means for transforming the supply voltage and thereby provide starting voltage and pre-heating current,
- b) Means to prevent cold starting,
- c) Means to correct the power factor or suppress radio interference or both, and
- d) Means to reduce stroboscopic effects.

### 3. MEASURING EQUIPMENT

**3.1 Sound Level Meter** — The sound level meter used shall be in accordance with IS : 3932-1967\*.

**3.1.1** The instrument used for the measurement of noise emitted by the ballasts for gaseous discharge lamps shall be sufficiently sensitive to give indication down to 20 dB.

**3.1.1.1** The overall response characteristic of the microphone, preamplifier, if any, and the sound level meter shall be in accordance with Table 1 of IS : 3932-1967\*.

**3.1.2** The measuring equipment shall be calibrated against acoustic standard at suitable intervals to ensure that it maintains the response characteristic specified in **3.1.1.1**.

**3.1.3** The microphone used should preferably be of the condenser type, but may be of the crystal type. The microphone should be small and preferably not exceeding 5 cm in diameter. It is desirable that the pressure sensitive diaphragm shall be close to the front of the microphone case, in order to facilitate the placing of the diaphragm at the test distance of 2.5 cm from the face of the ballast. Moving coil microphones are not suitable owing to their sensitivity to stray magnetic fields which may exist in the vicinity of the ballast.

**NOTE** — If a condenser-type microphone is used, it will be necessary to ensure that there is no effect from nearby magnetic fields on the wiring of the associated cathode follower.

**3.1.4** The measurements shall be made using the weighting network A (see IS : 3932-1967\*).

\*Specification for sound level meters for general purpose use.

#### 4. ACOUSTICAL ENVIRONMENT

4.1 In order to approximate as closely as possible to an acoustic environment similar to that of free space, the ballast under test should be located in a silent and echo-free room. However with care reliable tests may be made with the ballast mounted in a rigidly constructed acoustically dead box with a tightly fitting lid, and with its inner surfaces treated with sound absorbing material having a high absorption coefficient at least over the range of 500 c/s to 7 000 c/s.

4.1.1 The free air space inside the box should be such that there is a clearance of at least 20 cm between any face of the ballast and the nearest point of the box lining. While a single lined box may be adequate where the ambient noise is low, in less favourable situation it may be found necessary to use two or three boxes resiliently mounted one inside the other in order to achieve a sufficiently low level of residual noise in the measuring compartment.

#### 5. ELECTRICAL SCREENING

5.1 In order to reduce electrical pick-up to a negligible value and in view of the high degree of amplification involved, it is essential to screen the electrical supply leads to the ballast, and to earth this screen and the screen of the microphone cable.

5.2 Care shall also be taken to isolate the measuring equipment from any radio-frequency radiation from the lamp and its associated wiring. For this purpose, and as a minimum precaution, the lamp in circuit with the ballast under test should have a radio interference suppressor connected between its electrodes and close to it, and the lamps should be situated at least several metres from the measuring equipment. The metal casing of the ballast ( or the core if of open construction ) should also be earthed.

#### 6. TEST PROCEDURE

6.1 The lamp used in circuit with the ballast under test shall be an aged lamp with reference lamp characteristics [ see IS : 1534 ( Part I )-1960\* or Indian Standard specification for ballasts for high pressure mercury vapour discharge lamps ( *under preparation* )] and shall be operated in free air at an ambient temperature between 15° and 35°C.

6.2 The ballast under test shall be operated at rated voltage and frequency for a minimum of 10 hours, before noise tests are made, to ensure that a substantially steady operating temperature has been reached.

6.3 Thus prepared, the ballast shall be suspended by means of rubber bands or supported on rubber strips spanning the soundproof compartment, and

\* Specification for ballasts for fluorescent lamps: Part I For switch start circuits.

the microphone shall be placed with the plane of the diaphragm parallel with the surface of the ballast and spaced away from it so that the distance between the diaphragm and the nearest face of the ballast is  $2.5 \pm 0.25$  cm.

**6.3.1** The screened leads from the microphone and from the ballast are brought out of the box (see 4.1) at opposite ends through holes or channels plugged with sound absorbing material.

**6.4** A minimum of four measurements shall be made with the microphone opposite the middle of each of the four principal faces of the ballast in turn. Where the length of these faces exceeds 10 cm, two or more measurements shall be made against each of the four principal faces and at approximately 5 cm intervals.

**6.4.1** The ambient noise within the enclosure shall be measured before and after the measurements of 6.4 with the ballast and microphone in position but with the ballast circuit switched off.

**6.4.1.1** If the noise, as measured for the ballast in operation under test, is more than 10 dB above the ambient noise level, the latter may be ignored. Where the difference is less than 10 dB but more than 3 dB a correction shall be made to the individual readings of the ballast noise in accordance with the correction curve shown in Fig. 1. Satisfactory

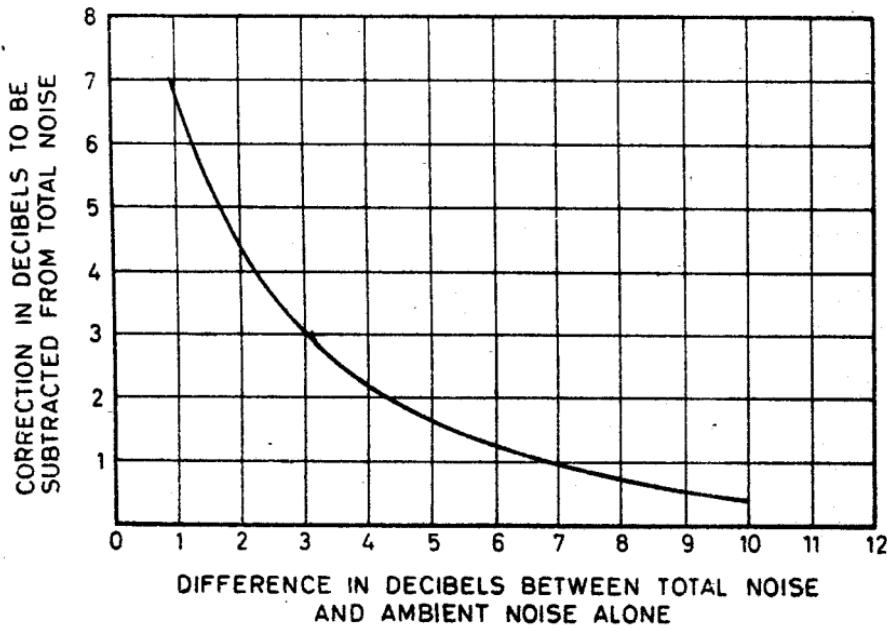


FIG. 1 CORRECTION TO BE MADE TO METER READING BECAUSE OF BACKGROUND NOISE LEVEL

measurement cannot be made if the total ambient noise (including any residual electrical pick-up and amplifier noise) is within 3 dB of the total noise measured in 6.4.

6.4.2 The measurements shall be made using the weighting network A of the sound level meter.

## 7. EVALUATION OF MEASUREMENTS

7.1 The noise level of the ballast under test shall be the highest reading (*see 6.4*) after correction for the ambient noise (*see 6.4.1*). Where the reading is close to the specified limiting value, whole test shall be repeated on at least three ballasts of the same type and the arithmetic mean of the three results shall be regarded as the noise level of the ballast.

# INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

## Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

## Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

## Derived Units

Quantity	Unit	Symbol	Conversion
Force	newton	N	1 N = 1 kg.1 m/s <sup>2</sup>
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1 c/s (s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>

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